What Is Claimed Is:

1. A method for generating a model for the functional response of a control device (120), the control device (120) being designed for calculating a suitable manipulated variable (u_d) for a downstream controlled system (130), in particular an air path system of an internal combustion engine, in response to a preselected setpoint value (y_d) for at least one controlled variable (y) of the controlled system (130), comprising the steps:
- preselecting a model representing the functional response of the controlled system (130) with the help of state variables (x_i), one of the state variables (x_i, where i = 1, ..., N) representing the controlled variable (y); and
- generating the model for the control device (120) by inverting the model for the controlled system (130); wherein the inversion includes the following steps:
- calculating an equation for the N^{th} derivative ($\overset{(N)}{y}$) of the controlled variable (y) as a function of the manipulated variable (u_d) and the controlled variable (y) itself and/or its derivatives of the n^{th} order $\left(\dot{y}, \ddot{y}, \ldots, \overset{(N)}{y}\right)$ with respect to time; and
- generating the model for the control device (120) by solving the equation for the N^{th} derivative ($\overset{(N)}{y}$) of the controlled variable (y) for the manipulated variable (u_d).

2. The method as recited in Claim 1, wherein the calculation of the N^{th} derivative of the controlled variable includes the following steps:
- selecting one of the state variables (x_i where i = 1, ..., N) as the controlled variable (y);

- calculating the 1st, 2nd, ... through N^{th} derivative $\left(\dot{y}, \ddot{y}, \ldots, \overset{(N)}{y}\right)$ of the controlled variable (y) for time as a function of the state variables (x_i) and possibly the manipulated variable (u_d);

- calculating each of the individual state variables (x_i where i = 1, ..., N) as a function of the controlled variable and/or its derivatives $\left(\dot{y}, \ddot{y}, \ldots, \overset{(N-1)}{y}\right)$ with respect to time by rewriting the equations for the derivations of the controlled variable;

- rewriting the N^{th} derivative of the controlled variable (y) by eliminating all state variables (x_i) in the N^{th} derivative $(\overset{(N)}{y})$ of the controlled variable by replacing these state variables (x_i) there by their corresponding functions as a function of the controlled variable (y) and/or its time derivatives of the 1st, ..., $(N - 1)^{th}$ order $\left(\dot{y}, \ddot{y}, \ldots, \overset{(N-1)}{y}\right)$; and

- generating the model for the control device (120) by solving the rewritten N^{th} derivative $(\overset{(N)}{y})$ of the controlled variable (y) for the manipulated variable (u_d).

3. The method as recited in one of the preceding claims, wherein the model of the controlled system (130) maps the functional response of the controlled system with the help of model equations only inasmuch as the response is relevant for a control and/or regulation of the controlled variable.

4. A computer program having program code for a control system or regulating system,

wherein the computer program is designed for performing the method as recited in one of Claims 1 through 3.

5. A data medium characterized by the computer program as recited in Claim 4.

6. A control system (100) for controlling a controlled variable (y), comprising:

- a setpoint value preselecting device (110) for preselecting at least one setpoint value (y_d) for the controlled variable (y), in particular in the form of a trajectory sequence;
- a control device (120) for converting the setpoint value (y_d) into at least one manipulated variable (u_d); and
- a controlled system (130) for controlling the controlled variable (y) at its output in response to the manipulated variable (u_d), so that the controlled variable (y) is adjusted to the setpoint value (y_d),

the functional response of the controlled system (130) and the control device (120) being represented by separate models in each case, and the model for the control device (120) corresponding to the inverse of the model for the controlled system (130),

wherein the model for the control device (120) is formed by:

- calculating the N^{th} derivative of the controlled variable as a function of the manipulated variable and the controlled variable itself and/or its derivative of the n^{th} order with respect to time, where n = 1, ... N - 1; and
- generating the model for the control device by solving the N^{th} derivative of the controlled variable for the manipulated variable.

7. A regulating system for regulating a controlled variable, comprising:

a control system as recited in Claim 6;

a regulating device (150) for calculating a correction factor (u_{ctrl}) for the manipulated variable from a received control deviation (e) between the controlled variable (y) at the output of the controlled system (130) and the setpoint value (y_d); and

an addition and/or subtraction device (140) for calculating a corrected manipulated variable (u) for the controlled system (130) by adding the correction factor (u_{ctrl}) for the manipulated variable to the manipulated variable (u_d) calculated by the control device (120).